

AMENDMENTS TO THE SPECIFICATION

Please replace paragraph 0003 with the following amended paragraph.

[0003] Another technique to exploit the energy reserve in deep coal beds has been to drill two or more wells into the coal formation. The coal in the formation is [[to]] set on fire at one of the wells and [[extract]] the gaseous products of the burning coal are extracted through other wells. This method produces a gas product which was relatively dirty containing carbon monoxide, long-chain hydrocarbons, and other combustion products from the burning coal. Thus, the produced fuel gas is useful in powering electric generators located near the well heads, such a procedure is illustrated in U.S. Patent 4,271,904 entitled "Method for Controlling Underground Combustion". The gas produced by the burning coal is of limited value for transportation of a clean gas which is competitive with natural gas.

Please replace paragraph 0012 with the following amended paragraph.

[0012] Some of the energy content in subterranean coal formations is accessed by drilling a wellbore into the coal formation. Drilling a well is usually the only practical way to access coal at depths below 1,000 feet from the surface. These coal formations typically contain methane and other hydrocarbon gases which can be produced from the well. Methane desorbs from coal matrix and can only move through the formation via fractures called butt cleats and cleats. To improve a well's ability to produce gas, coal formations can be fractured by fracturing techniques such as those used in natural gas and petroleum wells. The purpose of fracturing is to provide fissures or channels through which gas and fluids can migrate to the wellbore for extraction to the surface. However, such techniques as hydraulic fracturing with a variety of fluids and proppants, can [[only]] extend fractures only a limited distance from the wellbore into the formation. These techniques are also quite expensive. The present invention provides an alternative technique to fracture [[as]] a subterranean coal formation to increase the production of clean gas from the formation.

Please replace paragraph 0015 with the following amended paragraph.

[0015] The present invention can be used in wells which have a substantially vertical borehole or ones which have boreholes produced by directional drilling. In the preferred embodiment of the present invention, air is injected into the coal formation via the wellbore. Any oxidizing gas may be used. Air is the preferred oxidizing gas because it is inexpensive. Oxygen or oxygen-enriched air can also be utilized. Preferably, air is pumped into a well and underlying coal formation at a rate and pressure which is above the reservoir pressure and substantially equal to or greater than the fracturing pressure of the coal formation. The injection pressure can be less than the fracturing pressure of the formation and the method still be employed as long as sufficient rate of several thousand standard cubic feet per minute can be injected in order to involve a sufficient amount of coal into the process. Injected water, water vapor, or foamed water, will cool the wellbore and remove heat on the near wellbore side of the reaction. This results in an increased volume entering the formation due to heat expansion of air, conversion of water to steam, disassociation of water, and will cause gas volume to move outward at a high rate from the wellbore, elevating pressure until it ~~[[fratures]]~~ fractures the formation and opens the natural cleat system. Injecting air at a pressure in excess of the fracturing pressure is preferred as it will tend to open up the natural cleats in the coal formation and increase the rate of oxidation and temperature. Injecting air at elevated pressure prior to providing an ignition source starting the oxidation process may be beneficial as oxygen will be ~~[[absorbed]]~~ adsorbed onto the coal face and be available to react quickly. If the formation has previously been fractured by other techniques, injecting the oxidizing gas at a pressure above the facturing pressure will tend to open up those pre-existing fractures and also increase the amount of oxygen ~~[[absorb]]~~ adsorbed. Preferably, air is continued to be pumped into the formation in order to saturate the coal in the volume near the wellbore so that the coal will become enriched with oxygen prior to ignition of the coal. A record of the volume of oxidizing gas injected into the wellbore should be maintained.

Please replace paragraph 0019 with the following amended paragraph.

[0019] In the event that the formation is penetrated by more than one wellbore, all but one of the wellbores are ~~[[preferable]]~~ preferably sealed to prevent contamination of produced gas due to channeling to the other boreholes by the exhaust of oxidizing gas through the open borehole. This causes the fire to channel and follow the path of the oxygen. Channeling between two wellbores may increase production by providing improved pathway between wellbores with both wells producing from it. The main intent is to cause fractures and fissures projecting radially from the wellbore in all directions. In large formations, oxidizing gas can be injected in two or more wells simultaneously, and a fire started adjacent to multiple wellbores and forced outward into the formation from multiple wellbores. Simultaneous injection is not preferred because as the fires radiate from multiple wellbores, formation pressure will be elevated requiring more horse power to inject air and water and may reach the pressure limitation of the wellbore casing.

Please replace paragraph 0021 with the following amended paragraph.

[0021] By conducting a mass balance, one can determine from the amount of oxygen which has been injected in the coal formation the amount of coal that amount of oxygen would burn. From this information, the BTU value of the burning coal can be determined. The amount of cooling media injected to force the fire away from the borehole is an amount which is sufficient to allow the BTU balance of the burning coal to remain positive for continued burning. Preferably the cooling media injected is in a quantity ~~[[sufficient to result in]]~~ such that the BTU content of the air, coal and cooling media is 60% or less than the BTU content of the coal and air. The quantity of cooling media is more preferably such that the BTU content of the air, coal and cooling media is from 60% to 10% of the BTU content of the air and coal without the cooling media. When the cooling media contains water it will disassociate on the side of the fire near the wellbore. The water injected into the wellbore at the area of the burning coal will disassociate, cooling the near wellbore area and forcing the fire outwards from the wellbore. On the outside edge of the fire, the water will recombine (re-associate) to produce possibly some water, carbon dioxide, carbon monoxide, methane, and some long-chain carbon molecules.

Disassociation is ~~[[a]]~~ an endothermic reaction removing heat with products traveling to the opposite side of the fire to re-combine which is ~~[[a]]~~ an exothermic reaction, and will aid in the continued burning of the coal away from the wellbore.

Please replace paragraph 0022 with the following amended paragraph.

[0022] As the coal burns, it will leave ash. The ash content of the coal will vary depending on the type of coal, and the volume of ash will typically ~~[[will]]~~ be ten to twenty percent of the volume of the unburned coal. ~~[[Thus, the]]~~ The ash will occupy much less space than the coal that was burned, thus burning of the coal creates fractures and passageways through the formation while eroding a path through them at the same time. Thus, by converting the coal to ash, large fractures and passageways are created.

Please replace paragraph 0025 with the following amended paragraph.

[0025] If desired, prior to extinguishing the coal, a large slug of water can be injected into the well. The purpose of this injection is to achieve the further fracturing of the coal formation. When the slug of water reaches the intense heat of the fire in the formation, it will explosively turn to steam and disassociate with great force causing further fractures in the formation. A slug of water refers to the injection of ~~[[a]]~~ water ~~[[in a thick stream]]~~ at a high rate of flow to inject a predetermined ~~[[slug]]~~ quantity of water. In a preferred embodiment, the slug of water is injected when it is desired to extinguish the fire thereby achieving additional fracturing while at the same time extinguishing the fire.

Please replace paragraph 0026 with the following amended paragraph.

[0026] After the coal has been extinguished, the well can be placed back into production. The initial production may contain some of the combustion gas products. The quality of the gas produced from the formation will improve as the combustion products are ~~[[absorbed]]~~ adsorbed into the formation and also removed from the well. After the combustion products have been removed from the well, the gas produced will be of a

quality similar to that achieved from the well without burning of the coal. Thus, the present invention provides a method to fracture a well which is much more economical than fluid mechanical fracturing, and can extend the fractures much further than conventional fracturing techniques while eroding a pathway to the wellbore by consuming coal and turning it into ash along one or more main fracture [[path]] paths. The method of the present invention results in the conversion of a portion of the coal to ash. Since the ash content and volume is substantially less than that of the coal, fractures and cleats of a larger size than possible with a conventional process are created.